

Cave Resources

Carlsbad Caverns National Park

The caves of Carlsbad Caverns National Park, in the Guadalupe Mountains, are unique in their speleogenesis. Unlike most caves that form along fractures with running water and mild solutions of carbonic acid, Guadalupe Mountains caves were formed by sulfuric acid. Hydrogen sulfide gas from deep oil reserves percolated up into the oxygen-rich water table forming sulfuric acid which slowly dissolved the large chambers we see today. Evidence of this reaction between sulfuric acid and the Capitan reef limestone is the massive deposit of gypsum found in many Guadalupe caves.

Significant Resources

Carlsbad Caverns National Park currently has 87 known caves, ranging from 50 feet to 102.23 miles of mapped passage. They differ in location, access, visitation, and natural and cultural resources. Carlsbad Cavern, the most-visited cave, was the primary reason for the creation of the park. Lechuguilla Cave is the most pristine cave known in the park and is restricted to researchers and survey teams. The other 85 caves fall into three categories: interpretive caves, recreational backcountry caves, and wild caves. Interpretive caves are those where access is by guided tour only. Spider, Ogle and Slaughter Canyon caves fit this definition. Access to recreational backcountry caves is by permit only. Wild caves are not open to the public, and are reserved primarily for administrative monitoring and as protected resources.

Carlsbad Cavern

Native Americans knew of the caves in the Guadalupe Mountains long before settlers of the American west. Although Native Americans were the first to know about Carlsbad Cavern, it was not until a cowboy by the name of James Larkin White that the cave was initially explored.

Soon after that, Carlsbad Cavern was mined for bat guano, and much of which was directly responsible for the success of California citrus groves. Ogle Cave, Slaughter Canyon Cave, and Lechuguilla Cave were other park caves also mined for guano.

Carlsbad Cavern contains three miles of paved visitor trails, with an additional 27 miles of known passage that range in impact from pristine to heavily impacted. The cave faces numerous threats from the visiting public as well as from present practices of the NPS. A recent infiltration study documented direct evidence of surface pollution filtering into the cave from parking lot runoff and possible broken sewer lines. The study, by Mark Brook of the Colorado School of Mines, found significant concentrations of heavy metals and high nitrates in various pools in the cave. Surface developments including the visitor center, office complexes, housing, a major maintenance yard, and parking lots with accompanying water, sewer, electrical, and propane lines are located directly above a large portion of the cave and are direct threats to the cave and its resources.

A vandalism study conducted in 1993 indicated that approximately 16,000 formations had been broken and removed from the cave in an eight-year period. The paving of the visitor trails with epoxy and emery chips has left thousands of chips scattered off the trail in the cavern. The cleaning of the visitor trails has also contributed to the chip dispersal, as well as adding sludge material into the cave. Lint and dust accumulations from the nearly 37 million visitors who have toured the cave since 1924 continue to be a major problem. The placement and maintenance of electrical lines, waterlines, light fixtures, and other assorted items inside the caver have also had their impacts over the years. A concessions area operates within the main resource despite the fact that it is unnecessary and impacting the cave as well as the

natural experience for visitors. Measures have been taken to mitigate some of these threats, but more long-term solutions are needed.

Volunteers for the Cave Research Foundation have spent hundreds of hours helping the park maintain and restore portions of the cave. Other volunteer groups continue their efforts to clean up the cave and, in particular, to remove tons of rubble placed in the cave when the elevator shafts were blasted in 1930 and the 1950s.

Two science projects are underway in Carlsbad Cavern. Diana Northup from the University of New Mexico is studying certain speleothems to determine whether or not they are biogenic. Charlie Russell of Midland, Texas is continuing a microclimate study and monitoring evaporimeters throughout the cave. A graduate student from the University of New Mexico is interested in doing a study on microbial human impact of pools along the trail in Carlsbad Cavern. Resurveying of Carlsbad Cavern is progressing well, with 27.36 miles of mapped passage. The Cave Research Foundation and four private groups are participating in the resurvey project.

An environmental assessment titled *Visitor Walkway Installation Lower Cave, Carlsbad Cavern* is out for public comment. The walkways are proposed to mitigate the introduction of foreign microbes and mud into pools and water-covered flowstone. The walkways will be built and installed in FY 2000 if the NPS preferred alternative is chosen. Wooden bridges in Left Hand Tunnel need to be evaluated and studied for possible replacement. They are infested with smelly molds, leaving their structural integrity in question.

Lechuguilla Cave

Lechuguilla Cave is a highly significant resource because it contains rare and unique speleothems such as never-before-recorded subaqueous helictites, rare hydromagnesite balloons, 20-foot-long gypsum chandeliers, 20-foot-long gypsum hairs, and massive sulfur deposits. The microbial community of Lechuguilla contains chemosynthetic microbes that derive their energy from sulfur and iron. Some of the microbes found in Lechuguilla may have medicinal qualities.

Lechuguilla Cave remains in a relatively pristine condition due to the management policies that have regulated access to the cave since the major breakthrough that discovered the main part of the cave in 1986. The passage of the *Lechuguilla Cave Protection Act* in 1993 has protected the cave from the external threat of gas and oil drilling along the northern border of the park. However, threats still exist for Lechuguilla and possibly Carlsbad Cavern from gas wells that were drilled north of the park prior to the passage of the bill. Urine deposition from explorers and researchers continues to be a problem; however, researchers are looking for ways to filter out the urea and sugars, leaving only salts that would be safe to deposit into the urine deposition sites.

Microbiological research continues in Lechuguilla. Dr. Penny Boston and Diana Northup are continuing to study the corrosion residues and pools for new and interesting microbes. Dr. Larry Mallory has identified different microbes from isolated pools in Lechuguilla that have proven positive for medicinal qualities. Harvey DuChene's mineralogy study continues, with 36 different minerals identified. The latest mineral identified was the green mineral barite in a stalactite form. Three Lechuguilla Exploration and Research Network survey expeditions and three private survey expeditions are allowed each year. Lechuguilla Cave is now the third-longest cave (102.23 miles of mapped passage) and the deepest limestone cave (1,567 feet below the surface) in the United States.

Spider Cave

Spider Cave is a center of renewed interest as scientists are investigating the corrosion residues and microbial communities within them. The corrosion residues in Spider Cave are similar to those found in Lechuguilla. Spider Cave has a weekly tour on Sundays, and visitor impacts are being carefully monitored.

Slaughter Canyon Cave

Slaughter Canyon Cave has visitor tours on weekends during the school year and every day during the summer months. Volunteers from the Mesilla Valley Grotto are involved in restoration projects and trail flagging to mitigate human impacts. Currently there are no science projects in Slaughter Canyon Cave.

Ogle Cave

Ogle Cave is visited on a limited basis. Two trips a month are allowed and must be guided by a member of the park's Cave Resource Office. Charlie Russell is conducting a cultural resource study of old mining artifacts. Ogle Cave has an annual habitation by cave swallows.

Recreational Backcountry Caves

There are eight backcountry caves that can be visited for recreational use by permit only. Permits are given to experienced cavers only. Goat Cave and Lake Cave are the only two caves that can be considered horizontal caves, the remaining six caves have vertical entrances or pits to be negotiated. Lake Cave is only open for visitation from May 1st through September 1st due to a population of federally listed *Myotis thysanodes* bats. Lake, Goat, Christmas Tree, and Deep Cave have populations of cave swallows in the entrances. Most of the backcountry caves have flagged trails that visitors must stay on and the caves are monitored. However, human impact or other science projects would be welcome.

Backcountry Caves

There are 74 known backcountry caves that are not visited except for administrative monitoring. Most of the backcountry caves are located in remote areas of the park and involve long hikes to access them. As with most Guadalupe Mountain, caves they require knowledge of vertical caving techniques to enter them.